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HEWLETT PACKARD COMPANY
P O BOX 272400, 3404 E. HARMONY ROAD
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FORT COLLINS, CO 80527-2400

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LEWIS, BEN

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ipa.mail@hp.com
jessica.l.fusek@hp.com

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Application Number: 10/674,053
Filing Date: September 29, 2003
Appellant(s): ULMER ET AL.

Steven L. Nichols
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 9th, 2009 appealing from the Office

action mailed October 10th, 2008.

Real party in Interest

(1)   A statement identifying the real party in interest is contained in the brief.

(2)   Related Appeals and Interferences

There are no related Appeals and Interferences to this Appeal.

(3)   Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4)   Status of Amendments After Final

The appellants' statement of the status of amendments after final rejection

contained in the brief is correct.

(5)   Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6)   Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection in the brief is correct.

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claim 1, 3-7 and 28-45 rejected under 35 U.S.C. 103(a) as being unpatentable over Ballantine et al. (U.S. Pub. No. 2003/0008184 A1).

With respect to claims 1, 28, 34 and 40, Ballantine et al. disclose a method and apparatus for controlling a combined heat and power fuel cell system (title).

Regarding the function of the controller, Ballantine et al. teach a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Regarding the function of the switch circuit, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballentine et al. teach that a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Ballentine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Ballentine et al. do not specifically teach switching to a more serial if more heat is required and switching to a more parallel configuration if less heat is required. However, in the system of Ballentine et al. all the elements are present therefore it would have been obvious one of ordinary skill in the art at the time the invention was made to switch the fuel cell system of Ballentine et al. in the same manner as claimed by applicant since applicant claimed an apparatus an all the elements of applicant's claimed apparatus are present in the fuel cell system of Ballentine et al.

With respect to claims 4, 6 and 7, Ballentine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group

to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to claim 5, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballentine et al. teach that teach a controller is adapted to coordinate response to data signals from the power sink

and the heat sink. As examples, such data signals from the heat sink may include a

temperature indication or a heat demand signal (such as from a thermostat), and such

data signals from the power sink may include a voltage or current measurement, an

electrical power demand signal, or an electrical load (Paragraph 0013).

    With respect to claim 29, Ballantine et al. teach that the invention provides an

embodiment where the balance between the heat and power demand signals is

accommodated by selectively connecting at least two fuel cells within a group to

increase the amount of heat that is generated for a given amount of power production.

Where a system is adapted to selectively connect one or more cells in parallel, the cells

that are selectively connected are connected via a switched network, rather than being

stack in series as in a conventional stack. For example, two fuel cells may be

connected to a switch that is connected to two electrical paths. When the system

controller causes the switch to select one of the paths, this results in the cell being

connected in series with another cell. When the other path is selected, the cell will be

connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

    With respect to claim 30, Ballantine et al. teach that the system also performs a

check 612 for a heat demand signal. If there is no heat demand signal, the system

continues in optimization mode 610. Where there is a heat demand signal, the system

then performs an increase 614 in the reactant flow rates. For example, in this example,

for a constant power demand, increasing the fuel flow rate will increase the amount of

unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat

(Paragraph 0079).

        With respect to claims 31-33, 35 and 44, Ballantine et al. teach that the invention

provides an embodiment where the balance between the heat and power demand

signals is accommodated by selectively connecting at least two fuel cells within a group

to increase the amount of heat that is generated for a given amount of power

production. Where a system is adapted to selectively connect one or more cells in

parallel, the cells that are selectively connected are connected via a switched network,

rather than being stack in series as in a conventional stack. For example, two fuel cells

may be connected to a switch that is connected to two electrical paths. When the

system controller causes the switch to select one of the paths, this results in the cell

being connected in series with another cell. When the other path is selected, the cell

will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

        With respect to a temperature measurement circuit, Ballantine et al. teach that

teach a controller is adapted to coordinate response to data signals from the power sink

and the heat sink. As examples, such data signals from the heat sink may include a

temperature indication or a heat demand signal (such as from a thermostat), and such

data signals from the power sink may include a voltage or current measurement, an

electrical power demand signal, or an electrical load (Paragraph 0013).

        Ballantine et al. teach that the system also performs a check 612 for a heat

demand signal. If there is no heat demand signal, the system continues in optimization

mode 610. Where there is a heat demand signal, the system then performs an increase

614 in the reactant flow rates. For example, in this example, for a constant power

demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the

fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

      With respect to claims 37 and 43, Ballantine et al. teach that the invention

provides an embodiment where the balance between the heat and power demand

signals is accommodated by selectively connecting at least two fuel cells within a group

to increase the amount of heat that is generated for a given amount of power

production. Where a system is adapted to selectively connect one or more cells in

parallel, the cells that are selectively connected are connected via a switched network,

rather than being stack in series as in a conventional stack. For example, two fuel cells

may be connected to a switch that is connected to two electrical paths. When the

system controller causes the switch to select one of the paths, this results in the cell

being connected in series with another cell. When the other path is selected, the cell

will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

      With respect to a temperature measurements, Ballantine et al. teach that a

controller is adapted to coordinate response to data signals from the power sink and the

heat sink. As examples, such data signals from the heat sink may include a

temperature indication or a heat demand signal (such as from a thermostat), and such

data signals from the power sink may include a voltage or current measurement, an

electrical power demand signal, or an electrical load (Paragraph 0013).

With respect to claims 38, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballantine et al. teach that teach a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power

demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the

fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

With respect to claims 39, 41, 42 and 45 Ballantine et al. teach that the invention

provides an embodiment where the balance between the heat and power demand

signals is accommodated by selectively connecting at least two fuel cells within a group

to increase the amount of heat that is generated for a given amount of power

production. Where a system is adapted to selectively connect one or more cells in

parallel, the cells that are selectively connected are connected via a switched network,

rather than being stack in series as in a conventional stack. For example, two fuel cells

may be connected to a switch that is connected to two electrical paths. When the

system controller causes the switch to select one of the paths, this results in the cell

being connected in series with another cell. When the other path is selected, the cell

will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

Ballantine et al. teach that the system also performs a check 612 for a heat

demand signal. If there is no heat demand signal, the system continues in optimization

mode 610. Where there is a heat demand signal, the system then performs an increase

614 in the reactant flow rates. For example, in this example, for a constant power

demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the

fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Claim 24 is rejected under rejected under 35 U.S.C. 103(a) as being

unpatentable over Ballantine et al. (U.S. Pub. No. 2003/0008184 A1).

With respect to claim 24, Ballantine et al. disclose a method and apparatus for

controlling a combined heat and power fuel cell system (title).

Regarding means for supplying an excess amount of fuel and producing heat

from the excess amount of fuel, Ballantine et al. teach that the system also performs a

check 612 for a heat demand signal. If there is no heat demand signal, the system

continues in optimization mode 610. Where there is a heat demand signal, the system

then performs an increase 614 in the reactant flow rates. For example, in this example,

for a constant power demand, increasing the fuel flow rate will increase the amount of

unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat

(Paragraph 0079).

Regarding identifying whether more or less heat is required, Ballantine et al.

teach that the system also performs a check 612 for a heat demand signal. If there is

no heat demand signal, the system continues in optimization mode 610. Where there is

a heat demand signal, the system then performs an increase 614 in the reactant flow

rates. For example, in this example, for a constant power demand, increasing the fuel

flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is

processed in the oxidizer to generate heat (Paragraph 0079).

Regarding means for switching Ballantine et al. teach that the invention provides

an embodiment where the balance between the heat and power demand signals is

accommodated by selectively connecting at least two fuel cells within a group to

increase the amount of heat that is generated for a given amount of power production.
Where a system is adapted to selectively connect one or more cells in parallel, the cells
that are selectively connected are connected via a switched network, rather than being
stack in series as in a conventional stack. For example, two fuel cells may be
connected to a switch that is connected to two electrical paths. When the system
controller causes the switch to select one of the paths, this results in the cell being
connected in series with another cell. When the other path is selected, the cell will be
connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

Ballentine et al. do not specifically teach switching to a more serial if more heat is
required and switching to a more parallel configuration if less heat is required.
However, in the system of Ballentine et al. all the elements are present therefore it
would have been obvious one of ordinary skill in the art at the time the invention was
made to switch the fuel cell system of Ballentine et al. in the same manner as claimed
by applicant since applicant claimed an apparatus an all the elements of applicant's
claimed apparatus are present in the fuel cell system of Ballentine et al.

Claim 25 is rejected under rejected under 35 U.S.C. 103(a) as being
unpatentable over Ballantine et al. (U.S. Pub. No. 2003/0008184 A1).

With respect to claim 25, Ballantine et al. disclose a method and apparatus for
controlling a combined heat and power fuel cell system (title).

Regarding means for supplying a constant amount of fuel and producing heat
from the excess amount of fuel, Ballantine et al. teach that the system also performs a

check 612 for a heat demand signal. If there is no heat demand signal, the system

continues in optimization mode 610. Where there is a heat demand signal, the system

then performs an increase 614 in the reactant flow rates. For example, in this example,

for a constant power demand, increasing the fuel flow rate will increase the amount of

unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat

(Paragraph 0079).

Regarding means for switching Ballantine et al. teach that the invention provides

an embodiment where the balance between the heat and power demand signals is

accommodated by selectively connecting at least two fuel cells within a group to

increase the amount of heat that is generated for a given amount of power production.

Where a system is adapted to selectively connect one or more cells in parallel, the cells

that are selectively connected are connected via a switched network, rather than being

stack in series as in a conventional stack. For example, two fuel cells may be

connected to a switch that is connected to two electrical paths. When the system

controller causes the switch to select one of the paths, this results in the cell being

connected in series with another cell. When the other path is selected, the cell will be

connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

Regarding means for reducing fuel efficiency, Ballantine et al. teach that in

another embodiment, the method includes shorting at least one fuel cell within the fuel

cell stack in response to a control signal to provide additional heat into a fuel cell stack

coolant fluid. In another embodiment, the method may include selectively electrically

connecting fuel cells in a low efficiency mode (e.g., some cells in parallel rather than in

series) in response to a control signal (e.g., a heat demand signal as from a thermostat)

to provide additional heat into a fuel cell stack coolant fluid (Paragraph 0095).

Regarding means for increasing EMF efficiency, Ballantine et al. teach that

referring to FIG. 7, another flow diagram 700 is shown of a control scheme for a CHP

fuel cell system to illustrate various logical options that may be implemented by a

system to balance a combination of heat and power demand signals. In a first state

702, there is a power demand, but no heat demand. In response, the system lowers the

reactant flow rates in step 704 to a point where the power demand can still be met.

Step 704 serves to maximize fuel efficiency. In this mode, the system also exhausts its

waste heat to ambient in a step 706 (e.g., the environment outside the fuel cell system,

or to the atmosphere) (Paragraph 0082).

Ballentine et al. do not specifically teach switching to a more serial if more heat is

required and switching to a more parallel configuration if less heat is required.

However, in the system of Ballentine et al. all the elements are present therefore it

would have been obvious one of ordinary skill in the art at the time the invention was

made to switch the fuel cell system of Ballentine et al. in the same manner as claimed

by applicant since applicant claimed an apparatus an all the elements of applicant's

claimed apparatus are present in the fuel cell system of Ballentine et al.

(7) Argument

Applicants argue that: In direct contrast to claim 1, Ballantine fails to teach or

suggest a fuel cell system including a controller wherein the controller increases heat

production by increasing fuel consumption by switching to a more serial configuration,

and decreases heat production by decreasing fuel consumption by switching to a more

parallel configuration. To the contrary, Ballantine teaches the exact opposite. Ballantine

*describes a "cogeneration fuel cell system" that "is operated among various modes **to***

***balance heat and power demand signals.** In general, a fuel cell system is coupled to*

a power sink and a heat sink, and a controller is adapted to respond to data signals

from the power sink and the heat sink." (Ballantine, Abstract) (emphasis added).

Ballantine teaches "generating a heat demand signal when the thermal parameter of the

heat sink is below a predetermined level; and.., selectively connecting at least two fuel

cells in the fuel cell stack in parallel in response to the heat demand signal. (Ballantine,

para. [0015]) (emphasis added). Similar language is contained in paragraph [0129] of

Ballantine as well. Further, Ballantine teach connecting fuel cells in parallel in response

to a heat demand signal (e.g. in order to increase heat within a system) throughout the

Ballantine reference. For example, Ballantine teaches that [i]n a first operating mode,

the sections of cells are connected in series, and in a second operating mode, at least

two sections of cells are operated in parallel. In general, the first and second operating

modes will provide different operating efficiencies in terms of the amount of heat

produced per unit power. For example, the second operating mode may produce more

heat. (Ballantine, para. [0090]) (emphasis added). Further, Ballantine teaches that "the

method may include selectively electrically connecting fuel cells in a low efficiency mode

(e.g., some cells in parallel rather than in series) in response to a control signal (e.g., a

heat demand signal as from a thermostat) to provide additional heat into a fuel cell stack

coolant fluid." (Ballantine, para. [0095]) (emphasis added). Similar language is

contained in paragraph [0097] of Ballantine as well. Finally, Ballantine teaches that "a

group of fuel cells generally produce a greater amount of waste heat when they are

connected in parallel rather than in series. One reason is that the cells generally operate

at a lower efficiency in such a configuration, so that more waste heat is generated."

(Ballantine, para. [0130]) (emphasis added). In direct contrast to the teachings of

Ballantine, claim 1 recites a controller that increases heat production by increasing fuel

consumption by switching to a more serial configuration and decreases heat production

by decreasing fuel consumption by switching to a more parallel configuration. Thus, per

claim 1, a parallel configuration of fuel cells results in a decrease in heat production,

and not an increase in heat production as the Ballantine reference teaches.

Consequently, Ballantine teaches away from claim 1 by stating the exact opposite of

that which is claimed. Appellant notes that a reference must be considered for all it

teaches, including disclosures that teach away from the invention as well as disclosures

that point toward the invention. Ashland Oil, Inc. v. Delta Resins & Refractories, Inc. 776

F.2d 281, 227 U.S.P.Q. 657 (Fed. Cir. 1985).

In response Examiner notes that, a recitation of the intended use of the claimed

invention must result in a structural difference between the claimed invention and the

prior art in order to patentably distinguish the claimed invention from the prior art. If the

prior art structure is capable of performing the intended use, then it meets the claim. In

this case, Ballantine et al. do not specifically teach switching to a more serial if more

heat is required and switching to a more parallel configuration if less heat is required.

However, in the system of Ballentine et al. all the elements are present therefore it would have been obvious one of ordinary skill in the art at the time the invention was made to switch the fuel cell system of Ballentine et al. in the same manner as claimed by applicant since all the elements of applicant's claimed apparatus are present in the fuel cell system of Ballentine et al. Examiner also notes that the switching to a more serial configuration when more heat is needed and a more parallel configuration when less heat is needed can be achieved by modifying the programming the controller of the prior art which one of ordinary skill in the art would be capable of performing.

Applicants argue that: as recited in claim 1, a temperature measurement circuit capable of measuring the temperature of the first fuel cell or the second fuel cell is provided. In contrast, Ballentine fails to teach or suggest measurement of the temperature of a fuel cell. The final Office Action concedes that Ballentine teaches "that a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat) ...." (Action, p. 2). Consequently, Ballentine teaches that the temperature of a fuel cell system is measured at a heat sink, and does not teach or suggest that the temperature may be measured anywhere within the system other than at the heat sink. (Ballentine, paras. [0014], [0016], [0057]-[0058], [0070], and [0113]-[0114], for example). However, as indicated in claim 1, the temperature of the fuel cells, themselves, are measured using a temperature measurement circuit that is capable of measuring the temperature of the

first fuel cell or the second fuel cell. Thus, according to claim 1, the temperature of the

fuel cells is directly measured. Ballantine does not teach or suggest measuring fuel cell

temperatures directly.

In response Examiner notes that: With respect to a temperature measurement

circuit, Ballentine et al. teach that a controller is adapted to coordinate response to data

signals from the power sink and the heat sink. As examples, such data signals from the

heat sink may include a temperature indication or a heat demand signal (such as from a

thermostat), and such data signals from the power sink may include a voltage or current

measurement, an electrical power demand signal, or an electrical load (Paragraph

0013). Examiner also notes that Applicant has not claimed the temperature of the fuel

cells are "directly measured." Applicant claimed "a temperature measurement circuit

capable of measuring the temperature of the first fuel cell." Examiner interpreted the

temperature measurement to be either direct or indirect since there is no indication in

the claim language of the temperature measurement being solely direct.

(8)   Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9)   Evidence Relied Upon

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Number	Name	Date
US 2003/0008184 A1	Ballantine et al.	May 30th, 2002

(10)   Related Proceedings Appendix –37 C.F.R. 41.37 (c)(1)(x)

There are no related proceedings to this Appeal.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Ben Lewis/

Examiner, Art Unit 1795

Conferees:

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

/Dah-Wei D. Yuan/

Supervisory Patent Examiner, Art Unit 1795